

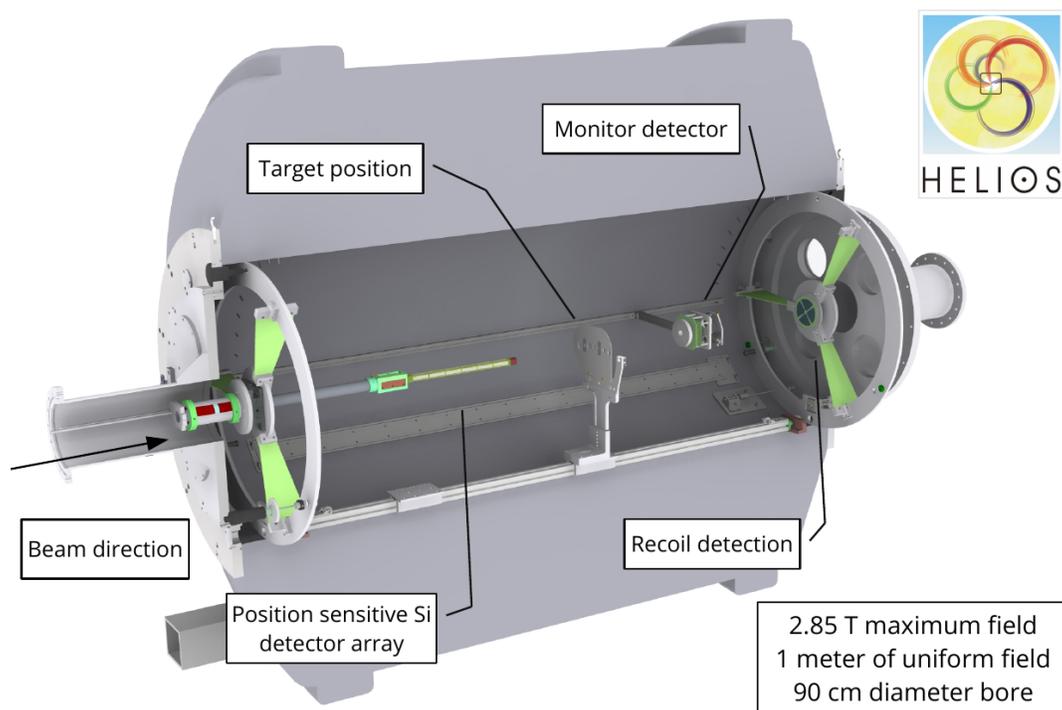
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# HELIOS - Helical Orbit Spectrometer

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HELIOS is a solenoid spectrometer that was designed to measure transfer reactions in inverse kinematics with improved  $Q$ -value resolution and simple charged-particle identification. It has been used in numerous inverse transfer reaction measurements including  $(d,p)$ ,  $(d,^3\text{He})$ ,  $(d,t)$ ,  $(^3\text{He},d)$  and  $(^6\text{Li},d)$  for beams with mass  $A=11-136$  and energy  $\sim 5-15$  MeV/u. Research programs centered around understanding the  $sd$  shell using light neutron-rich radioactive in-flight beams from ATLAS have been carried out in addition to single-neutron adding measurements on the stable noble gases at  $N=50$  and  $N=82$ . HELIOS will play a major role in nuclear structure and astrophysics research related to rare-isotope beams produced by both CARIBU and AIRIS.

A project to construct a new position-sensitive Si array and to outfit it with modern digital electronics is underway. The new Si array will improve the solid angle coverage for charged particle detection and allow additional flexibility in possible detection schemes. The following commissioned ancillary devices are also available for use in HELIOS: a cryo-cooled gas target having gas volume thicknesses ranging from 1-3 mm and Kapton windows of  $<10$   $\mu\text{m}$ ; a fast-counting multi-grid ionization chamber for recoil detection (contact: C. M. Deibel - LSU); and a CsI-LaBr<sub>3</sub>  $\gamma$ -ray detector (APOLLO) for particle- $\gamma$  coincidence measurements (contact: A. Couverture, H. Y. Lee - LANL).



**The current HELIOS layout at ATLAS including possible locations of the Si detector array for outgoing charged particle detection, an elastic scattering monitor, and a detector for recoil identification.**